Name: _____

Linear Algebra
Trigonometric Identities

Concept: in this worksheet, we will prove two trigonometric identities that we studied in Precalculus.

Consider the two matrices $M_\alpha = \begin{bmatrix} \cos\alpha & -\sin\alpha \\ \sin\alpha & \cos\alpha \end{bmatrix}$ *and* $M_\beta = \begin{bmatrix} \cos\beta & -\sin\beta \\ \sin\beta & \cos\beta \end{bmatrix}$

Question 1 Describe the effect of M_α

Question 2 Describe the effect of M_β

There are two ways we could consider a rotation of angle $\alpha+\beta$ *…*

- *Either we can simply write a matrix* $M_{\alpha+\beta}$ *following the same principle as the matrices written above (see question 3).*
- *Or we can consider it to be a composition of the two matrices* M_α *and* M_β*, by multiplying them (see question 4).*

Question 3 Write the matrix $M_{\alpha+\beta}$ that would produce a rotation of angle $\alpha+\beta$

Question 4 Calculate the product $M_\alpha \cdot M_\beta$.

These two techniques should yield the same result.

Question 5 Conclude the proof of two trigonometric identities by comparing the matrices in questions 3 and 4.